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VALUE ENGINEERING:
APPLICATION TO THE PROCUREMENT OF SPARE PARTS

by

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19 Abstract

The purpose of this thesis is to determine how and to what extent the Department of Defense Value Engineering (VE) effort can be utilized to improve the procurement of spare parts. An in-depth research effort was undertaken in this area. Interviews were conducted and data were collected from the DOD, DLA, and Navy Supply Systems Command regarding this topic. A comparative analysis of the data revealed trends and opportunities for VE application to the procurement of spare parts, which resulted in three conclusions: First, VE is a proven cost saving tool but is underutilized in spare parts procurement. To maximize savings, VE should be emphasized in the replenishment spare parts process. DOD must initiate efforts to encourage more contractor VE participation in the spare parts procurement process. Second, there continues to be a lack of top management support within the DOD for VE as a whole, which directly impacts on VE investment in spare parts procurement. An intensive training and education process is necessary for Government and contractor acquisition personnel emphasizing the benefits of the VE program. The third conclusion is that the current DOD procurement environment of reduced budgets and fewer major weapons acquisitions heightens the need for greater use of VE in the spare procurement process. Proper use of the Value Engineering program, in major systems acquisitions and spare parts procurement, possesses numerous opportunities and advantages for both the Government and contractors alike.

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Value Engineering: Application to the Procurement of Spare Parts

by

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ABSTRACT

The purpose of this thesis is to determine how and to what extent the Department of Defense Value Engineering (VE) effort can be utilized to improve the procurement of spare parts. An in-depth research effort was undertaken in this area. Interviews were conducted and data were collected from the DOD, DLA, and Navy Supply Systems Command regarding this topic. A comparative analysis of the data revealed trends and opportunities for VE application to the procurement of spare parts, which resulted in three conclusions: First, VE is a proven cost saving tool but is underutilized in spare parts procurement. To maximize savings, VE should be emphasized in the replenishment spare parts process. DOD must initiate efforts to encourage more contractor VE participation in the spare parts procurement process. Second, there continues to be a lack of top management support within the DOD for VE as a whole, which directly impacts on VE investment in spare parts procurement. An intensive training and education process is necessary for Government and contractor acquisition personnel emphasizing the benefits of the VE program. The third conclusion is that the current DOD procurement environment of reduced budgets and fewer major weapons acquisitions heightens the need for greater use of VE in the spare procurement process. Proper use of the Value Engineering program, in major systems acquisitions and spare parts procurement, possesses numerous opportunities and advantages for both the Government and contractors alike.

TABLE OF CONTENTS

I. INTRODUCTION

A. GENERAL

The purpose of this thesis is to develop an understanding of the Department of Defense Value Engineering (VE) program, to what extent it is currently utilized, and how it can be applied to the procurement of spare parts. This chapter provides an overview addressing the reasons for applying VE to spare parts procurement, the objective of this research, the research questions to be addressed, the research scope, the research methodology, and concludes with a brief description of the organization of this study.

B. OVERVIEW

Value Engineering is basically an analysis and design for cost savings. It is an attempt to achieve optimal value without degrading from the quality or function of the required end product. At this point it is important to distinguish between what is meant by value and cost as they are two distinctly different expressions. Value is defined as: (1) the worth of a thing in money or goods at a certain time, and/or (2) the utility of an item in directly or indirectly satisfying a recognized need [Ref. 15: p. 23]. Cost is defined as: (1) general usage: the amount of money or equivalent incurred for supplies or services including profit

or fee, and/or (2) in contracting: the amount of money or equivalent paid for supplies or services exclusive of profit or fee [Ref. 15: p. 19]. The fundamental concept of Value Engineering is to strive for maximum value in the desired end product while reducing costs.

In today's environment of ever decreasing budgets and increasing costs, "right sizing" of our force structure, public scrutiny of Government procurement practices, and continued oversight and influence from Congress, acquisition personnel must take aggressive action in any potential area that can save billions of critical defense budget dollars. For this reason it seems prudent that procurement personnel take a well proven cost reducing tool, that of Value Engineering, and ensure that it is being used to its fullest and not limit it to its traditional role with the procurement of new major weapon systems.

The many weapon systems utilized by the Department of Defense (DOD) are supported by more than four million spare parts and an expenditure of $22 billion in fiscal year (FY) 1984 [Ref. 44: p.5]. Spare parts are essential to maintaining fully functional and operational equipment for combat ready forces. They are procured to replace parts that are worn, broken, or malfunctioning. The range of spare parts includes inexpensive non-critical individual replacement parts, highly critical and expensive parts, and subassemblies or large components of supported end items.

The media has over the years identified numerous problems within the DOD procurement process for spare parts, an example being that of the $435 hammers and the like. As a result of the "pricing horror stories" there has been a continual trend in increased congressional oversight within our business. This has lead to a recent reform effort into the procurement of spares. On 25 July 1983, Secretary of Defense, Casper Weinberger, issued a ten-point outline which was followed by a twenty-five point plan of how the Military Departments should proceed to correct the problems that existed in the acquisition of spares.[Ref. 12:p. 10] This prompted each of the Services to undertake actions, the Navy result was to develop the Buy Our Spares Smart ("BOSS") program.

The spare parts procurement process is somewhat different from that of major system acquisitions. Spares are generally purchased in two phases to support a weapon system, the "initial" spares and "replenishment" spares. These two phases and processes will be explained in Chapter IV. This research will identify how the efforts and goals of the VE program can be used to enhance the acquisition process of spare parts.

C. RESEARCH OBJECTIVE

The purpose of this thesis is to develop an understanding of how the Department of Defense Value Engineering program has progressed throughout its thirty plus years, with an emphasis on the Department of the Navy's efforts, the extent to which

it is currently used in the procurement of spare parts and how VE can be applied to strengthen the acquisition process of spare parts.

D. RESEARCH QUESTIONS

The primary research question is derived from the above stated research objective and asks: How and to what extent is the Department of Defense's Value Engineering program applicable to the procurement of spare parts, and how should VE be utilized for maximum benefit?

The following subsidiary research questions were developed to assist in answering the primary research question:

1. What are the principal features of the DOD's VE program?
2. To what extent is VE applied to spare parts procurement?
3. Which programs or areas are most successful in implementing VE and why?
4. What characteristics of spare parts are most pertinent to application of the VE concept?
5. What approach should DOD use in applying VE to spare parts procurement?

E. SCOPE OF RESEARCH

This thesis develops an understanding of the DOD's Value Engineering program and how it is and can be more successfully applied to the procurement of spare parts. The study focuses on current utilization of VE efforts within the Department of the Navy (DON), more specifically the Naval Supply Systems Command (NAVSUP). Both the DOD in-house and contractor value

engineering programs are looked at and evaluated. Currently, it appears that the majority of the VE effort applied to spares procurement within the Navy is accomplished in the in-house program [Ref. 51]. A look at what can be done to improve and expand contractor participation in VE for spares is addressed in both Chapters V and VI. It is assumed that the reader of this study is somewhat familiar with acquisition concepts and terminology as well as the basics in spare parts procurement, avoiding any need for great detail in either area.

F. RESEARCH METHODOLOGY

The research methodology utilized in this study involved a comprehensive review of the available literature and interviews with key value engineering personnel at the Defense Logistics Agency (DLA) and the Department of the Navy, i.e., NAVSUP, Aviation Supply Office (ASO), and Ships Parts Control Center (SPCC). The literature research included a review of: (1) Professional journals and periodicals; (2) Research reports published by United States military postgraduate schools; and, (3) United States Department of Defense publications. The interviews conducted were informal and structured around the guidelines provided by the questions stated in Appendix A

G. ORGANIZATION OF THE STUDY

This study provides an introduction into the background history and development of the Department of Defense Value Engineering program in Chapter II. Chapter III provides an overview of the current DOD and Department of the Navy (DON) VE program and policies. The spare parts procurement process is explained in Chapter IV, identifying its uniqueness from the major system acquisition process.

Some problems or issues surrounding the current DOD VE procedures as well as successful application of VE are examined in Chapter V to identify and link these VE application successes with the procurement of spare parts. Chapter VI presents conclusions drawn from this research as well as recommendations to improve the implementation of the Value Engineering process within spare parts acquisitions.

II. HISTORY AND DEVELOPMENT OF VALUE ENGINEERING

A. INTRODUCTION

What is Value Engineering? Gleaning from the numerous references, VE can be described in simple, layman's terms, as an analysis and design process for cost savings, an attempt to achieve optimum value without degrading from the quality or function of the required end product. To develop a more complete understanding of this extensive field of VE, this chapter will first provide a definition of VE and give a brief background on the history and development of Value Engineering/Analysis.

In today's world of ever increasing costs, the rising Federal deficit, public scrutiny of Government procurement practices, and significantly reduced DOD budgets, it seems prudent that we undertake aggressive action in any program that can potentially save billions of dollars. It is not uncommon to read examples of savings-to-cost ratios of 10:1, 20:1, even 100:1, for every dollar invested in the VE process. For FY 1986, DOD reported $1.9 billion of in-house VE savings against an investment of $58 million for a reported return on investment (ROI) of $33 for every dollar invested [Ref. 32: p.1]. Clearly, the Government cannot and should not overlook any opportunity to save taxpayer dollars. The potential

savings that can be attained with a strong and well managed VE program can be quite significant.

B. VALUE ENGINEERING DEFINED

Value Engineering is the term that the Government has chosen to identify its program of Value Analysis, Value Management or Value Improvement (terms often associated with business and industry). For the purpose of this research, these terms will be considered synonymous. The Federal Acquisition Regulation (FAR) defines "Value Engineering" as:

> An organized effort to analyze the functions of systems, equipment, facilities, services and supplies for the purpose of achieving the essential functions at the lowest life cycle cost consistent with required performance, reliability, quality and safety. [Ref. 46:p. 48-2]

The FAR definition reflects a systematic and objective evaluation of a product's or service's function and its related costs, often associated with price and cost analysis. Value Engineering can be a relatively expensive and demanding technique that may include analysis of the product's function, present and anticipated future operating costs, alternative approaches to the problem and their anticipated costs. For relatively small dollar acquisitions, it also can be a brief survey using questions like:

> Can the product, or any part of it, be eliminated?
> Can a standard part replace a special one?
> Can a lower-cost product, material, or method be used?
> Are paperwork requirements excessive or unreasonable?
> Can parts be packaged more economically? [Ref. 45: p.2-1]

DOD manuals and instructions provide Value Engineering definitions which are quite similar to the FAR, with some slight variations in wording or terminology. It must be understood that VE applies to hardware and software; development, production, and manufacturing specifications; standards, contract requirements and other acquisition program documentation; facilities design and construction; and management or organizational systems and processes to improve the resulting products [Ref. 29: p. 6-O-5].

The last few words of the prior sentence are very significant; "management or organizational systems and processes to improve the resulting products." This relates to the testimony of Mr. Alphonse J. Dell'Isola, Vice President of Smith, Hinchmann & Grylls Associates, Inc., a well known Value Engineering advocate since the 1960's. He defines Value Engineering as:

> Value Engineering basically is a management plan, an organized approach, that dedicates time and effort towards the realization of optimization of costs. ...total costs, and that includes the follow-on costs to run, staff, maintain and operate. [Ref. 10: p. 7]

He further states that optimizing costs without sacrificing needed qualities or performance areas is essential. Mr. Dell'Isola's concept of VE being a "management plan" is a crucial element to ensuring any VE effort to be successful. The need for and use of a management plan, this philosophy or

concept will be more fully developed in Chapters V and VI. With a clear understanding of the definition of VE, the next two sections will address the VE history and development and DOD involvement in VE.

C. VALUE ENGINEERING HISTORY AND DEVELOPMENT

The methodology of Value Engineering within the DOD was developed as a result of "Value Analysis" which was first developed by the General Electric (G.E.) Corporation in 1947. At this time Mr. Lawrence D. Miles, an engineer at G.E. was asked to develop a method to improve product efficiency by substituting less expensive materials which would still perform necessary functions. He developed a common-sense approach known as "Value Analysis" (VA), created to identify unnecessary costs. He defined VA as:

> A philosophy implemented by the use of a specific set of techniques, a body of knowledge, and a group of learned skills. It is an organized creative approach which has for its purpose the efficient identification of unnecessary cost, i.e., costs which provides neither quality nor use nor life nor appearance nor customer features. [Ref 18:p. 1]

Mr. Miles further states that VA results in an orderly utilization of alternative materials, newer processes, and abilities of specialized suppliers. It focuses on one objective, equivalent performance for lower costs; it provides step-by-step procedures for accomplishing its objective

efficiently. The process he developed operates via three basic steps:

1. Identify the function.
2. Evaluate the function by comparison.
3. Cause value alternatives to be developed. [Ref. 18: p. 14]

It is important to note too that "Best Value" is determined by two considerations: performance and cost [Ref. 18:p. 4]. Mr. Miles also emphasized that you must recognize who contributes to performance and value; "Each individual involved in bringing forth a product contributes...." [Ref. 18: p. 5]. This seems to follow nicely with today's changing environment and the push for Total Quality Leadership/Management (TQL/M).

Mr. Miles developed five basic questions for uncovering needed pertinent facts in his Value Analysis approach. They are:

1. What is the item?
2. What does it cost?
3. What does it do?
4. What else would do the job?
5. What would the alternative cost? [Ref. 18: p. 18]

Answers to these questions would allow for the collection of enough pertinent information to develop a sound base for a decision to be made in regards to cost reduction. These questions are of the same nature of those previously mentioned, referenced in the Office of Federal Procurement Policy (OFPP) "Desk Guide to Price and Cost Analysis". These are simple questions and can be easily answered, yet have a

powerful impact when incorporated in a well-established procedure or program for cost reduction.

D. DOD VE INVOLVEMENT

The DOD first became involved with Value Engineering in the 1950's. In 1954 the U.S. Navy Bureau of Ships adopted a modified version of G.E.'s value analysis concept in an attempt to reduce the cost of ships and related equipment. In applying the concept, the Navy directed its efforts primarily at cost avoidance during the initial engineering design stage and called the program "Value Engineering" [Ref 4:p. 561]. Eventually due to the success of the VE program within the Navy, the Army and Air Force were soon to follow suit. The DOD formally established a VE program in 1962.

Since its inception and over its thirty year life, the VE program has had its ups and downs. At the onset it seemed to flourish as it was well supported by top management due to its coincidence with then Secretary of Defense McNamara's cost reduction program [Ref 19:p. 6]. In 1984 President Reagan's Private Sector Survey on Cost Control renewed interest in VE throughout the DOD and in the Navy as well, where VE activity was practically dead [Ref. 2:p. 4]. The lack of Navy support for VE at that time is further exemplified by the GAO report dated 27 September 1983, which states:

> Value Engineering, a technique for reducing cost and improving productivity, ...although increased savings have been reported, Defense was still more than $300 million

> short of its fiscal 1982 savings goal. Navy lagged behind the other services. [Ref. 42: p. 1]

Following these public criticisms of the Navy's efforts in VE, there appeared to be a revitalization of the importance of value engineering within the Navy which lead to the implementation of a new VE effort. In 1986 the Navy established a monetary goal of $365 million for certain commands and the Marine Corps. The total savings reported for 1986 was $467 million, yet the audit report shows that only $237 million are truly VE savings [Ref. 32: p.29]. Value Engineering applied to spare parts procurement has received increased attention since the initiation of the 1983 Secretary of Defense plan to improve acquisition in this area. The Navy's focus has varied throughout the years depending primarily on the political climate and top management support at the time. The Navy Supply Systems Command (NAVSUPSYSCOM), PRICE FIGHTER Detachment, in Norfolk, Virginia, office has assessed over 40,000 spare parts through the VE process since 1983 [Ref. 48]. Approximately 1600 spares are reviewed annually for potential cost savings. Recently this office has shifted to the use of the "should cost" or "could cost" analysis process for spare parts. These two methods of spare parts evaluation are distingiushed by their degree of conservatism in establishing unit costs: "should cost" analysis uses highly accurate historical data of an item, such as direct material and labor costs, to arrive at a target unit

price for a spare part, i.e., a reasonable estimate of what the item "should cost"; "could cost" analysis looks at what technology is available and determines the most efficient process or technique of manufacturing (not necessarily what is currently being used) and determines what the item "could cost". The Price Fighter Detachment programs continue to generate large cost savings from these processes. The current policies and regulations of the DOD/DON VE program will be addressed in the next chapter.

III. CURRENT DOD VALUE ENGINEERING POLICY

A. DOD GUIDANCE

Before proceeding with an explanation of the current VE policies, the following definitions are provided as a common basis for understanding:

1. Value Engineering Change Proposal (VECP). A change proposal (a change in the contract, e.g., contract modification) that is submitted by a contractor under a value engineering incentive or program requirement clause included in a Federal contract. [Ref. 47: p. 2]

2. Value Engineering Proposal (VEP). A change proposal developed by employees of Federal Government or contractor VE personnel employed by the Government to provide VE services for the contract or program. [Ref. 47: p. 2]

3. Acquisition Savings. Savings resulting from the application of a VECP. Includes - instant contract savings, concurrent contract savings and future contract savings.

   a. Instant Contract Savings. Net cost reductions realized from the application of a VECP to a contract, e.g., unit cost reductions multiplied by the number of units affected, less the contractor's allowable development and implementation costs.

   b. Concurrent Contract Savings. Net cost reductions applicable to other contracts ongoing at the time of VECP accepted.

   c. Future Contract Savings. Net cost reductions of affected units of future contracts during the sharing period. [Ref. 46: p. 48-1]

4. Collateral Savings. Measurable net reductions resulting from a VECP in the Agency's overall projected collateral costs exclusive of acquisition savings. [Ref. 46: p. 48-1]

5. Contractor's Development and Implementation Costs. Those costs the contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs required to implement the VECP as required by Government acceptance of a VECP. [Ref. 46: p. 48-1]

Office of Management and Budget (OMB) Circular No. A-131 is the driving document which requires the use of Value Engineering, as appropriate, by Federal Departments and agencies to identify and reduce nonessential procurement program costs. Published in 1988, it required that each agency administrator establish and improve their VE efforts. The OMB circular lead to the development of formal VE offices and programs within the Department of Defense and its various Services. Within the Office of Secretary of Defense (OSD) the general responsibility for VE rests with the Assistant Secretary of Defense for Production and Logistics, ASD(P&L), and more specifically with the Director of Industrial Engineering and Quality, Office of the Assistant Secretary of Defense for Production and Logistics, DASD (PR)IEQ . In the Department of the Navy, general responsibility falls to the Assistant Secretary of the Navy for Research, Development, and Acquisition, ASN(RDA) and more specifically to the Deputy for Acquisition Policy, Integrity, and Accountability, (Dep, APIA) within the same ASN(RDA) office. [Ref. 29: p. 14-c-1]

The policy of OMB Circular No. A-131 required each of these newly founded offices to tailor its VE efforts to their respective mission and organizational structure. It emphasized the need for adequate funding, thorough training of personnel, proper management and monitoring of the VE program, and required data collection for reporting and updating the agencies' utilization of Value Engineering. It also identified the fact that in most agencies, a relatively few programs or projects comprise the majority of costs and value engineering efforts should be concentrated on these programs and projects [Ref. 47: p. 3]. The statement thus emphasized that VE efforts should be directed at major system acquisition programs and that is exactly where it went. To focus on the use of VE we must first understand the major system acquisition process.

The Department of Defense major system acquisition procedure and policies were recently streamlined in February 1991. A basic understanding of these procedures and policies is needed to fully appreciate the basis for VE in the major systems acquisition process as well as the spare parts procurement process. There are five major milestone decision points and five phases of the acquisition process, illustrated in Figure 1 on the following page. Prior to moving from one phase to the next, the phase objectives and minimum required accomplishments must be met, and proper approval received from the Defense Acquisition Board (DAB) which is chaired by the

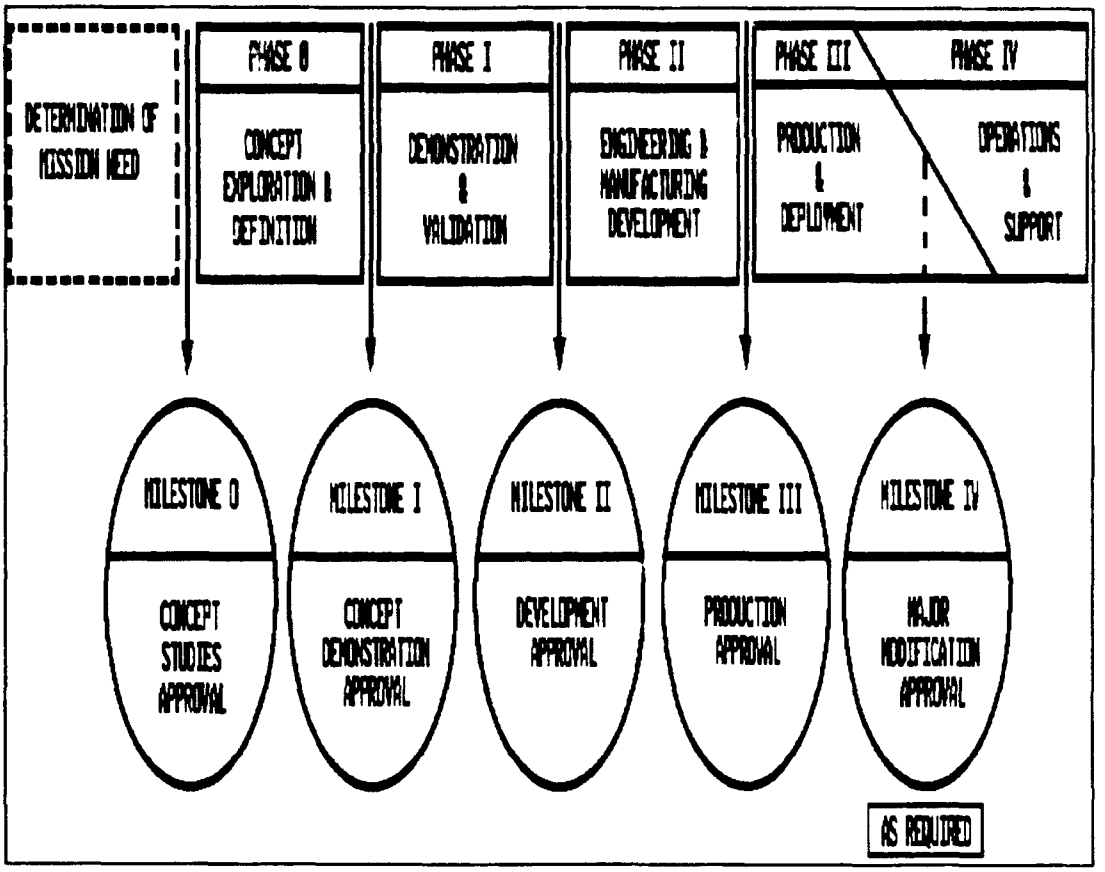


Figure 1: Acquisition Phases and Milestones

Source: DODD 5000.2M Defense Acquisition Management Policies and Procedures dated 23 February 1991.

Under Secretary of Defense (Acquisition) USD(A). This process of moving through the various phases and milestones can take only a few months or many years depending on the program and difficulties encountered along the way. It is in Phase II, Engineering and Manufacturing Development where the VE process is currently emphasized and executed. [Ref. 29: p.2-1]

The Engineering and Manufacturing Development (EMD) pha is when the program or project begins to fully develop and take shape prior to full Production and Deployment. At this point there is a move to efficiently and effectively integrate the production engineering, producibility, and VE efforts so that the system and its associated manufacturing processes can be designed and developed concurrently. [Ref. 29: p. 6-0-1] With this background understanding of the DOD acquisition process, the next section will address the actual VE techniques used in defense contracts.

B. CURRENT POLICY

As mentioned above, OMB Circular No. A-131 is the guiding DOD document for Value Engineering efforts and application (despite the fact that the circular has expired pursuant to a sunset provision contained therein, it remains in effect as a new and "more stringent" OMB circular is currently being written and reviewed [Ref. 52]). The detailed policies and procedures for implementing VE techniques in Government contracts is found in Part 48 of the Federal Acquisition

Regulation (FAR). The specific clauses for inclusion in contracts, identified as potential VE candidates and required by law, are located in FAR Part 52, specifically clauses 52.248-1 and 52.248-2 for the incentive and mandatory VE programs respectively. A VE clause is required to be included in solicitations and contracts when the contract amount is greater than $100,000 or of lesser value if identified by the contracting officer as a potential for significant savings. Five exemptions to this requirement are identified in the FAR, they are:

1. For research and development other than full scale development;
2. For engineering services from not-for-profit or nonprofit organizations;
3. For personal services;
4. Providing for product or component improvement, unless the VE incentive application is restricted to areas not covered by provisions for product improvement;or
5. For commercial products that do not involve packaging specifications or other special requirements or specifications. [Ref. 46: p. 48-5].

C. THE VE PROGRAM AND PROCEDURES

The VE program consists of two distinct components: an in-house effort and a contractor effort. The in-house effort is directed at internal operations through VE studies. Through this process Government employees are employed to study potential VE areas and develop recommended improvements to meet the VE objective of maintaining quality while seeking

to reduce costs. Their efforts result in the creation and submission of Value Engineering Proposals (VEPs). The contractor component is directed to stimulate and entice contractor submission of Value Engineering Change Proposals (VECPs) to reduce costs, and nonessential requirements, while maintaining quality and functional needs.

As noted briefly in the previous section, there are two Value Engineering clause types identified in the FAR for the contractor component: 1) An incentive approach using voluntary participation, and 2) A mandatory program requiring a specific VE effort by a contractor, where the Government pays for the contractor's VE effort. Both forms of VE clauses are unique in that they provide stimulus specifically designed for cost reduction contract changes. They are intended to foster a climate of cooperation and a win-win situation, where the Government acquires savings and the contractor collects increased profit dollars, as well as manage change to permit the Government to acquire higher quality, lower-cost items.

The incentive method encourages the contractor to voluntarily submit VECPs using his own resources. The "incentive" is a sharing arrangement of the savings realized and payment of the contractor's allowable developmental and implementation costs if the VECP is accepted [Ref 46:p. 48-2]. This VE "incentive" approach is typically used where there are detailed drawings, specifications, or designs that the contractor is working to [Ref. 8: p. 2]. The VECPs are

received in a similar manner as unsolicited proposals and thus require a thorough review.

The mandatory program requires the contractor to undertake a specified level of VE effort in accordance with the Government's program plan. When VECPs are accepted under this program, the contractor shares in the savings but at a lower percentage rate than that of the voluntary program. (Refer to Table 1 on the following page for sharing ratios and percentages) The primary objective of the mandatory program is to ensure that the contractor's VE effort is applied to areas of the contract that offer opportunities for considerable savings. This type of VE program is used more often when the work involves broad requirements, such as for functional or performance specifications [Ref. 8: p.2]. It should also be noted that the FAR specifically states that no sharing is permitted in Architect-Engineer (A&E) Contracts [Ref 46: p. 48-2].

As can be seen these sharing arrangements are dependent on the type of contract that the VECP is submitted under as well as the type of VE clause within the contract. The two general categories of savings previously defined; 1) acquisition savings, which includes instant, future, and concurrent savings, and 2) collateral savings, utilize the applicable sharing ratios from Table 1 when determining the Government and contractor sharing percentages.

TABLE 1

GOVERNMENT/CONTRACTOR SHARES OF VECP SAVINGS
(All Figures are in Percentages)

	VE INCENTIVE (VOLUNTARY)		VE PROGRAM REQUIREMENT (MANDATORY)	
CONTRACT TYPE	Instant	Future/ Concurrent	Instant	Future/ Concurrent
Fixed-Price (other than incentive)	50/50	50/50	75/25	75/25
Incentive (fixed-price or Cost)	*	50/50	*	75/25
Cost-Reimbursement (other than incentive)	75/25	75/25	85/15	85/15

* SAME AS THE SHARING RATIO IN THE CONTRACT

Source: Federal Acquisition Regulation, Part 48

The processing of Value Engineering Change Proposals (VECPs) is the responsibility of the contracting Officer. The contracting officer or other designated official shall promptly process and objectively evaluate each VECP. The Government is responsible for accepting or rejecting the VECP within 45 days of receipt [Ref. 46:p. 48-3]. If more time is needed to evaluate the VECP, the contracting officer shall notify the contractor in writing explaining the reason and anticipated decision date. Any VECP may be approved, in whole

or in part, by a contract modification. The decision to accept or reject a VECP; the determination of collateral costs or savings; and the decision as to which of the sharing rates applies, are not subject to the disputes clause or otherwise subject to litigation under the Contract Disputes Act of 1978 [Ref. 46: p. 48-3]. Each DOD component is required to compile and submit an annual statistical summary of their value engineering efforts to the Assistant Secretary of Defense for Production and Logistics within 45 days of the close of the fiscal year [Ref. 31: p. 13-1]. Building on this summary understanding of the DOD VE program, a brief look at the Navy's VE guidance follows.

D. THE NAVY'S VE PROGRAM

The Navy implements its Value Engineering program through the Commander, Naval Supply Systems Command (NAVSUPSYSCOM), via NAVSUP INSTRUCTION 4858.52A of 14 December 1988 [Ref. 36]. The Navy policy states:

> The VE methodology shall be utilized to effect cost restraint on systems, equipment, facilities, and material being developed, designed, procured, produced, constructed, maintained, modified, and stored. Such restraint is to be exercised by eliminating unessential requirements and specifications, integrating VE into the entire process of acquisition and logistic support, emphasizing the accomplishment of VE in the initial design/development phases prior to prototype production, of all Navy weapons systems and products to assist in determining unit cost-to-produce and support cost goals, and by emphasizing accomplishment of VE when procuring large quantities of identical components, items, parts, and equipment. [Ref. 36: p. 2]

As noted in the above quote, it appears that the Navy is attempting to push for implementation of the VE effort as early as possible in the acquisition process. This seems quite appropriate due to the fact that it is generally recognized that earlier use of this cost saving technique can only lead to greater savings in the long run. The Navy guidance assigns NAVSUPSYSCOM responsibilities which include; implementation of the Navy VE program, designating a program administrator, reviewing the VE program at field activities, coordinating training requirements, managing and coordinating the Incentive Awards program, and collecting VE performance data and reports [Ref. 36:p. 3].

With the foundation set on how the Government policies are structured to work, a quick look at the current practices of Value Analysis within Industry will provide background for comparison with the Government's practices of VE.

E. INDUSTRY VALUE ANALYSIS

Industry as with Government has seen its peaks and valleys with Value Analysis. A quick look at the covers of Purchasing magazine seems to be indicative of the way VA is viewed. In 1985, "Value Analysis" was in bold capital letters with the background a brilliant Gold plate and more than 30 pages dedicated to various articles on VA. A similar issue was published in 1986 with a Silver plate background on the cover. For the 1990 and 1991 issues covering VA, there was just a

small blocked out section on the top of each cover with the respective statements; "VA Report '90" and "'91". These issues published 10 to 15 pages on Value Analysis. This seems to reflect the trend in VA within industry in general, that Value Analysis is not one of the companies top priorities.

Another indicator of industry's current VA practice is reflected in a conversation with Len Struessel, Vice President of Production, General Dynamics (GD), Pamona, during a plant visit in May 1992 [Ref. 54]. He stated that GD had no one specifically assigned to a Value Engineering/Analysis process, however, the responsibility of evaluating the products and the manufacturing process was accomplished within the Industrial Engineer Division of the company. He further went on to say that the priority of responsibilities within the production department were: 1) quality, 2) schedule, and 3) cost. Therefore, VE cannot be considered the top priority, but should receive significant attention with cost being in the top three concerns of production. This seems to follow good business practice as all companies seek to make a profit and a reduction in costs should increase profit with all other variables remaining constant.

F. SUMMARY

Appendix B provides a sample Value Engineering application problem which explains the process that a contracting officer would be required to follow when a VECP is accepted from a

contractor. It's quite simple and brief, and will provide the reader a more complete understanding of the Value Engineering terms and process discussed in this chapter, as well as reflect the VE impact on cost savings for both the contractor and the Government. With the basic understanding developed in the past two chapters, of where VE has been and the current policies in effect, the spare parts acquisition process will be explained in the next chapter. The subsequent chapters will examine where Government procurement officials and contracting officers might best implement the use of these VE policies, specifically in the acquisition for spare parts.

IV. SPARE PARTS ACQUISITION PROCESS

A. INTRODUCTION

The spares acquisition environment was tarnished in the 1980's by several horror stories trumpeted by Congress, the media and others. Examples include the over pricing cases of the common $15 claw hammer for $435; the 4 cent diode for $110; and the 45 cent allen wrench for $9000, to name only a few [Ref. 12: p. 9]. These certainly are not representative of the true spares acquisition arena which is quite different, made up of millions of parts and subassemblies. However, as a result of these difficulties, then Secretary of Defense, Casper Weinberger, published a memorandum to the Services and the Defense Logistics Agency (DLA) outlining a ten-point spare parts procurement get well plan [Ref. 22]. The Secretary immediately followed up this plan with another memorandum mandating twenty-five specific actions to be taken by the Services in controlling spare parts prices [Ref. 23]. In response to this guidance, each of the Services and DLA initiated ambitious reform programs. Examples of programs which have evolved as a result of the Secretaries direction include the "Break-Out" program, the Army's Spare Parts Review INiTiative (SPRINT), and the Navy's Buy Our Spares Smart (BOSS) program. Each of these reforms focuses on increasing

competition, reducing the cost of spares to the Government, while attempting to institutionalize sound purchasing practices.

For the purpose of this thesis spare parts will be an all inclusive term, defined as:

> Spare parts. Spares and repair parts, reparable and consumable, purchased for use in the maintenance, overhaul, and repair of equipment such as ships, tanks, guns, aircraft, missiles, ground communication and electronic systems, ground support and associated test equipment. ... it includes items, spares, repair parts, parts, subassemblies,components, and subsystems, but excludes end items such as aircraft, ships, tanks, guns, and missiles. [Ref. 44: p. 5]

As noted earlier this definition of spare parts includes millions of individual items. The most current estimate is approximately 9.4 million total spare parts, with DLA responsible for managing roughly 66 percent of these, for a total of 6.2 million [Ref. 50].

The following pages will familiarize the reader with the DOD spare parts procurement process by first defining and discussing the two distinct facets of spare parts acquisitions, initial spares and replenishment spares, and then provide an overview of each of these procurement processes.

B. INITIAL AND REPLENISHMENT SPARE PARTS DEFINED

Spare parts are generally purchased in two phases to support a weapon system. The first phase is called "initial" or "provisioning" spares and takes place as part of the weapons system contract. These initial parts are the parts required to support the first group of weapon system units fielded from the first system production contract. The purchase of initial spare parts occurs primarily during the early production phase of the weapon system. They are continued to be procured to support modifications and design changes. Once design stabilization has been accomplished and the initial weapon system supported through the initial spares, there is a shift to the second phase of spare parts procurement known as "replenishment" spares. These replenishment spares are procured on subsequent contracts or orders, after identifiable demand patterns have been established. Accordingly, replenishment spare parts acquisitions are limited during the early production phase and increase substantially as time progresses.

C. THE SPARE PARTS ACQUISITION PROCESS

Planning for the procurement of spare parts should start at the very beginning of the acquisition cycle, e.g., included in the overall acquisition strategy or plan, which acts as the road map for execution of the entire program. The early phases of major system acquisitions require numerous reports

and approvals at the milestone decision points prior to progressing along further in the procurement cycle. One such required report that pertains to the spare parts realm is the Logistics Support Analysis (LSA). This requirement, along with others, will be addressed in more detail as the two spares acquisition processes are developed. As discussed earlier the acquisition of spare parts falls into two distinct categories, initial and replenishment, and as a result each of these processes will be explained in the next two sections.

1. THE PROVISIONING SPARE PARTS PROCESS

Initial spares are selected through the process known as provisioning, which is the process of selecting spare parts and support equipment needed to support the weapon system when it is deployed [Ref. 44: p. 153]. To accomplish this task, both Government and contractor personnel, typically hard science and industrial engineers along with logisticians, are continuously conducting Logistics Support Analyses (LSA) throughout the developmental phase of the system procurement. These early LSA analyses will be used to address areas such as reliability and maintainability (R&M) as well as develop and define supportability related design and manufacturing factors [Ref. 29: p. 7-A-3]. The information and data that are generated from the LSA provides the basis for establishing the requirements in the provisioning process. The initial spare parts that are eventually identified and procured are usually

funded through the supported weapon system procurement account fund. This procurement account is the means by which investment programs are budgeted, authorized and funded by specific acts of Congress [Ref. 44:p 153].

Referring back to the major systems acquisition process (Figure 1), it is during phase two, Engineering and Manufacturing Development (EMD), when the Government requests, in the form of a contract data requirements list (CDRL), the contractor to develop a list of spares or repair parts that will support the initial end items fielded during Low Rate Initial Production (LRIP). The contractor must take several interacting variables, such as estimating failure rates of items and sufficient quantities to meet desired support, into consideration when developing the initial provisioning list. This process is quite complex, occurring at a period in the acquisition process when the design of the system has yet to be finalized; and therefore is based on numerous assumptions, speculations, and estimates interpreted by the contractor.

The provisioning list is also influenced in part by the Government, from decisions made by the program office which guide the support concept. These decisions focus primarily on the issue of the appropriate levels of maintenance - field, intermediate or depot - for the various components and the stage of development of the item [Ref. 44: p. 155]. The finalized list is provided in the form of a Logistics Support Analysis Record (LSAR). The Government and

contractor then meet in what is known as the provisioning conference which usually takes place shortly after award of the first production contract. It is here that the contractor documentation is formally reviewed and the list is approved and finalized. This conference and final list are critical since it is the base against which future requirements and acquisition decisions will be made [Ref. 44: p. 156].

The list of items are then assigned National Stock Numbers (NSNs), and the quantitative requirements for each part are consolidated into an initial provisioning order that is subsequently negotiated and agreed upon. The spare parts are then delivered to the inventory system [Ref. 44: p. 158]. The provisioning process is illustrated graphically by the diagram presented in Figure 2.

2. THE REPLENISHMENT SPARE PARTS PROCESS

After a weapon system spare part has been identified by the initial spare parts process and introduced into the DOD inventory, subsequent purchases are normally accomplished through the replenishment spare parts process. Replenishment spares are simply spares that are used to restock the supply system. Therefore, the replenishment procurement is the process of restocking the inventory as a result of parts being consumed by the operating and supporting (e.g., maintenance) activities [Ref. 44: p. 158].

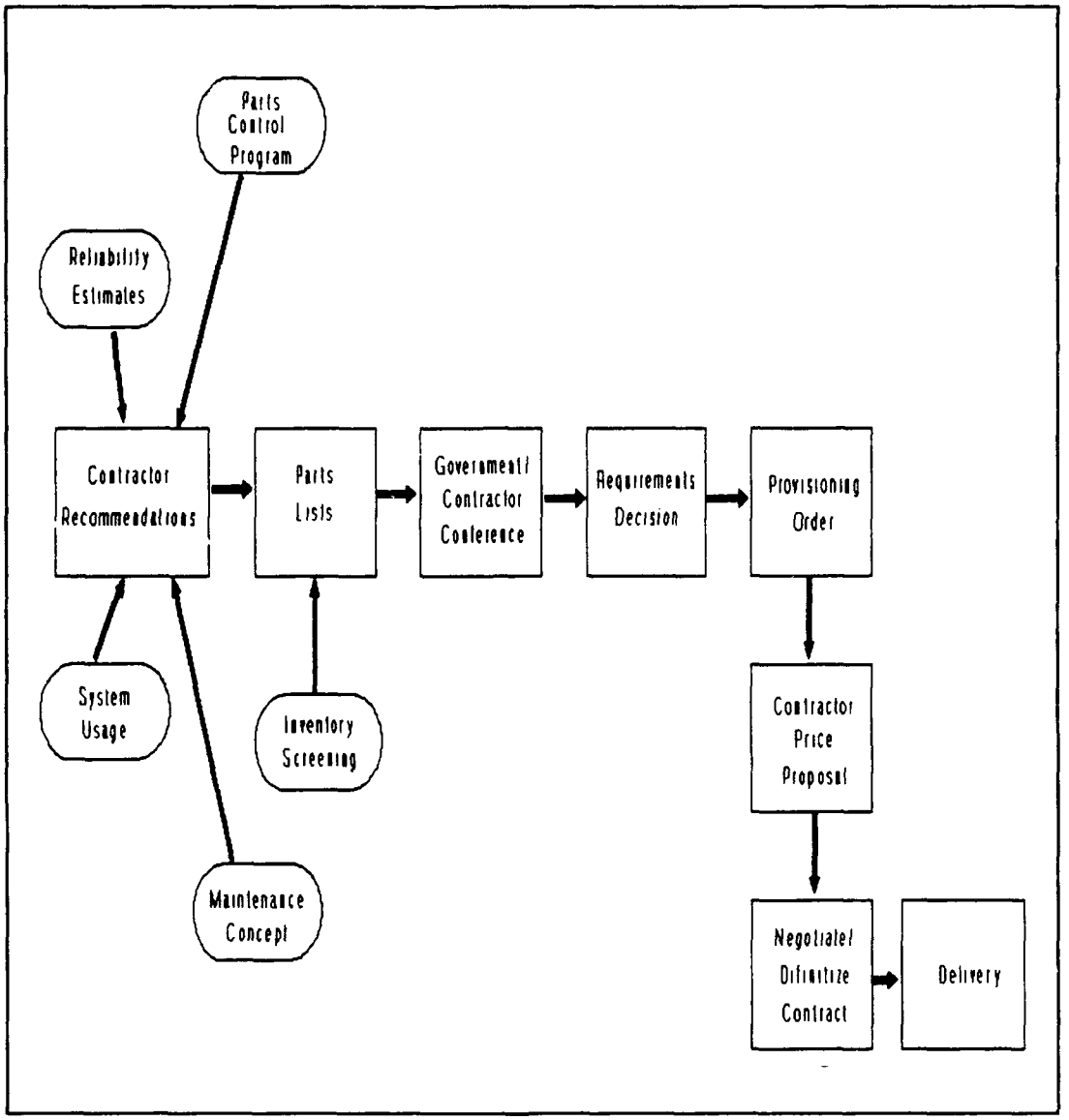


Figure 2: Provisioning Spare Parts Procurement Process

Source: OFPP Spare Parts Study [Ref. 44: p. 155].

Each spare part is managed by a single designated Inventory Control Point (ICP) within DOD and assigned to a specific item manager. There are seventeen ICPs within the DOD and they maintain sophisticated data base systems that provide logistical type data on each spare part to enhance and improve maintenance and support of the end item. There are many functional elements including unit cost, usage data, weapon system application, availability and appropriate stockage levels to name a few, that are intertwined, thus making the procurement of spare parts a very complex procurement process. Stock funds are typically used in the procurement of replenishment spares. A stock fund is a revolving account originally established through the capitalization of assets. Assets are sold from stock to customers who reimburse the stock fund from their appropriated funds at the time of the sale. The stock fund replenishes its asset position using its own capital and is not subject to in-depth Congressional review and approval as part of the normal fiscal year budget authorization process [Ref. 44: p. 153]. The diagram presented in Figure 3 illustrates the basic replenishment process.

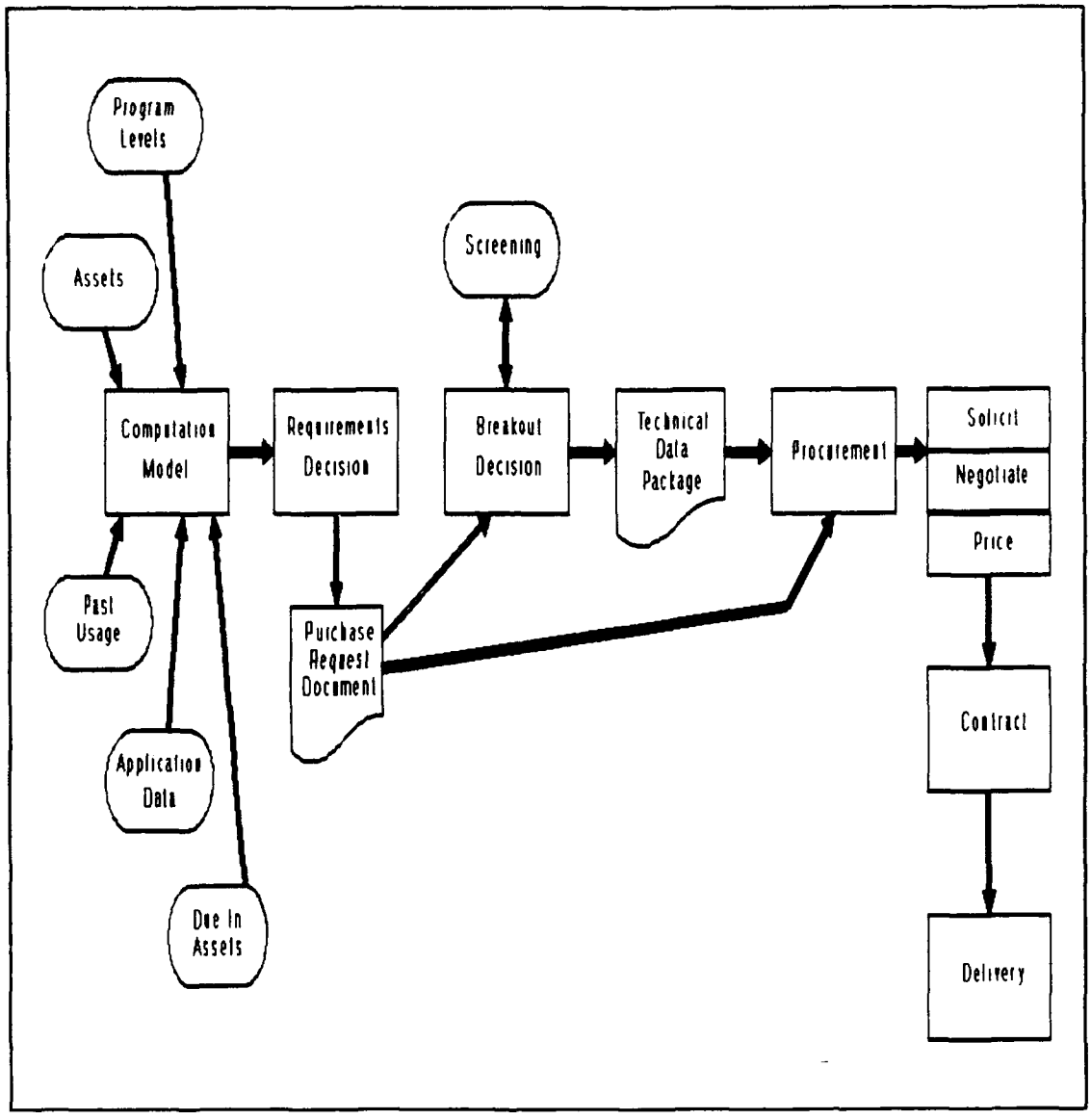


Figure 3: Replenishment Spare Parts Procurement Process

Source: OFPP Spare Parts Study [Ref. 44:p. 159]

D. SUMMARY

The Integrated Logistics Support (ILS) process and the development of LSAs are critical elements to insuring the acquisition of necessary initial spare parts. Note that these mechanisms are applied during the EMD phase, and as explained in the previous chapter, Value Engineering is also emphasized during EMD. Consequently initial spares are reviewed through the VE process to some extent due to this dual effort applied during EMD. However, it is essential to remember that the final configuration and design of the system has yet to be firmed up at this point and the initial quantities procured most likely are relatively small.

Because of the complexities of the provisioning process (in association with the major systems acquisition process) and the development of the initial spare parts list based primarily on guess work or estimates by the contractor, VE does not ideally lend itself to this process. As a result, it is this researcher's belief that significant VE application or effort should be directed at the procurement process of acquiring replenishment spares. It appears that numerous VE opportunities and significant savings might develop if VE is applied appropriately. A more complete and detailed analysis of this hypothesis is discussed next, in Chapter V. Also, the use of the stock fund in the process of replenishment spare parts procurement can have significant potential application

for increased Value Engineering efforts in the spares community as will be seen in Chapter V.

V. VALUE ENGINEERING APPLICATION TO SPARE PARTS PROCUREMENT

A. GENERAL OVERVIEW

As with any sound program there is no substitute for common sense and good judgment. Relatively few programs or projects comprise the majority of costs within the DOD and Department of the Navy, and thus, VE efforts should be concentrated on these programs and projects. Table 2 illuminates this point.

TABLE 2

DOD PRIME CONTRACT ACTIONS BY SIZE: FY 1991
(Contracts Over $25,000; Dollar Amounts in Millions)

SIZE IN DOLLARS BY CONTRACT		TOTAL		PERCENT	
		NUMBER	$AMOUNT	NUMBER	$AMOUNT
25,000-	49,999	65,482	2,043	28.6	1.6
50,000-	99,999	58,549	3,643	25.5	2.9
100,000-	199,999	38,689	4,802	16.9	3.8
200,000-	299,999	17,329	3,676	7.6	2.9
300,000-	499,999	17,492	5,859	7.6	4.6
500,000-	999,999	14,339	8,281	6.3	6.6
1,000,000-	1,999,999	8,150	9,269	3.6	7.3
2,000,000-	2,999,999	3,044	5,828	1.3	4.6
3,000,000-	4,999,999	2,551	8,156	1.1	6.5
5,000,000-	9,999,999	1,938	11,605	0.8	9.2
10,000,000-	OR MORE	1,755	63,134	0.8	50.0

Source: DOD (Washington Headquarters Services, Directorate for Information Operations & Reports)

As reflected in Table 2, by totalling the last 5 rows of data (i.e., the contracts greater than 1 million dollars), the DOD had a total of 7.6 percent of all contracts awarded that accounted for 77.6 percent of the total dollar amount. It is here, within these contracts, that the VE process and application must be emphasized to recognize the most lucrative results of additional cost savings.

The contractor program (VECP) savings goal as a percent of total obligation authority for the DOD has been established at 0.7 percent [Ref. 42:p. 14]. Despite the fact that this goal has been elusive over the years, the VE process has proven to be successful. Value Engineering success stories are numerous and range from improving small independent spare parts to major subassemblies for entire weapon systems as well as design process improvements for construction type projects. The GAO report (June 23, 1992) titled "Value Engineering: Usefulness Well Established When Applied Appropriately" drives home this point and contains an attachment that lists several other GAO titles over the recent years which are relevant to VE and its successful application [Ref. 43].

This chapter will analyze the VE procedure and its application to the spare parts acquisition process by: first, distinguishing and discussing repeated problems associated with VE in general; second, reviewing current VE statistical data collected during the research effort; third, identifying

and establishing the factors or criteria that are critical for VE use and relating their appropriateness to the spares procurement cycle; fourth, examining a recent VE effort oriented towards spare parts known as Logistics Engineering Change Proposals (LECPs), which has been initiated at the Aviation Supply Office (ASO), Department of the Navy; and finally, glance toward the future and where VE is headed.

B. VE PROBLEMS

History of the DOD VE program indicates that there are four broad areas of concern for achieving greater savings from contractor VECPs:

1. Lack of continuous top level DOD management visibility and support.
2. Inadequate incentives for DOD program and procurement personnel to strongly encourage contractor VECP activity.
3. Lack of contractor awareness and confidence that VECPs will be favorably received by DOD.
4. General management weakness in the VE program.

[Ref. 42: p. 17]

These four concerns and others (e.g., the timely processing of VECPs and unclear explanations of acceptance or rejection criteria), are highlighted in several of the references. These problems have been noted since the early 1970's and throughout the 1980's and still seem to be present in today's VE environment. The principal problem associated with accomplishing VE for spare parts is the lengthy approval

process [Ref. 51]. Manufacturers have occasionally accomplished significant portions of their production runs before the configuration control board approves the pertinent VECP. The DOD has made progress addressing these concerns at times, but continued effort for improvement is still needed. These problems will be discussed and evaluated from both the Government and contractor perspectives.

The most noted problem described by numerous references was the general attitude and lack of acceptance of VE by both Government and contractor personnel. Reasons for this viewpoint varied. Government concerns were driven by the realities of "defective pricing". There is good reason for this, as proven in the several GAO reports of recent years which focus on overpricing and defective pricing audits. Another issue expressed was that the companies would often hold back their best ideas, providing just enough to win award, so they could later improve their profits during the execution of the contract by submitting VECPs. This incremental approach to improvement is an area that VE advocates must be watchful of and ensure does not occur. As a result of these issues, defective pricing and holding back best ideas, a lack of proper top management support and recognition of the VE program within the DOD has evolved.

Another concern of the Government acquisition professional is one of contract integrity. To effectively implement VE within our various contracts, our initial step should be to

include it in the solicitation document, and make it part of the selection criteria. The incentive of the VE clauses cannot influence, impact, or effect the incentive or terms of the agreed contract. VECPs should not be rewarded both as value engineering shares and under performance, design-to-cost, or similar incentives of the contract. Thus, if the VECP is accepted, then it should only be rewarded under the VE clause and not the other incentives [Ref. 13: p. 695].

A few concerns from the contractor's point of view also deserve mention. The two most pressing factors influencing the contractor's desire to avoid VE was: 1) the processing time required to accept or reject the proposed VECP routinely exceeded the 45 day limit and 2) the approval/disapproval criteria were of questionable character. The first issue is self-explanatory, the Government needs to respond in a timely fashion or make the approval period longer to resolve this problem. The second concern might have some validity to it. The issue focuses around the approving authority, the contracting officer, who awarded the original contract. This problem can best be shown through the following brief example: a contractor submits a VECP to save dollars by changing a specification, and the contracting officer approves it. This can be perceived as a failure on the part of the contracting officer in his initial review and approval of the specification. As a result the contractor gets a percentage of the savings [Ref. 11:p. 16]. The additional profits

acquired by the contractor are also often related to an atmosphere of deficiency for the contracting officer's original actions regarding the contract. The option that the contracting officer often relies upon to avoid this potential embarrassing situation is to deny the VECP. Remember too, the contractor cannot dispute the approval or disapproval of his VECP, so the approving authority has an avenue out.

Despite the problems associated with the Value Engineering program, it still remains to be an effective and positive method towards cost reduction. A review of current VE statistical data from various DOD organizations follows.

C. STATISTICAL DATA REVIEW

This section will provide a comparative analysis of four years (1989 through 1992) of statistical data from the total DOD VE program, the Defense Logistics Agency (DLA) and the Navy Supply Systems Command (NAVSUP). The evaluation and review of these data will reveal or identify trends that are apparent in the VE program statistical reports. The DOD figures will be reviewed and commented on first, followed by the DLA and NAVSUP information which is directly related to spare parts VE savings.

1. DOD VE STATISTICS

Tables 3 and 4 are summaries of the DOD VE program, first by the contractor (VECPs) program and then the in-house program (VEPs). Appendix C provides a detailed breakdown of

this information by individual Service and DLA and provides additional statistics such as personnel assigned to VE and training accomplishments.

TABLE 3

DOD VALUE ENGINEERING PROGRAM SUMMARY
(Contractor Program VECPs)

	1989	1990	1991	1992
# of VECPs Submitted	1176	929	672	964
# VECPs Approved	816	635	420	392
% APPROVED	69.6%	68.4%	62.5%	40.7%
NET SAVINGS	$216.8M	$242.6M	$398.7M	$319.9M
ROI	7:1	10:1	3:1	3:1

Source: Developed by the researcher.

On average the annual submission of contractor generated VECPs is 935. Most notably exhibited in Table 3 is a trend in the percentage of VECPs being approved, starting at almost 70 percent and dropping to nearly 40 percent in a four year period. It is well-realized that the Government will only approve a VECP if it will increase the value of the item and/or reduce costs, but this trend can only deter contractors from participating in the DOD VE program. Also, the contractor net saving for each year is relatively low and the return on investment ratios are well below the minimum (15:1) ratio the Government establishes, which must be estimated prior to initiating action on a VEP. These data paint a

gloomy picture for the contractor; its no wonder few desire to be active players in the Value Engineering program.

Table 4 presents the statistical data from the DOD's in-house VE program.

TABLE 4

DOD VALUE ENGINEERING PROGRAM SUMMARY
(In-House Program VEPs)

	1989	1990	1991	1992
# of VEPs Submitted	7769	7349	11,141	8439
# VEPs Approved	4655	4934	5146	4401
% APPROVED	59.9%	67.1%	46.2%	52.2%
NET SAVINGS	$1.23B	$1.2B	$699.5M	$750.4M
ROI	26:1	29:1	23:1	15:1

Source: Developed by the researcher.

The information from Table 4 resembles a much more effective and stable VE program. Note how the approval rate averages about 53 percent and the ROI (return on investment) ratios are in excess of 20:1 with the exception of last year, which was only 15:1 but this still greatly exceeded any of the contractor ROI ratios over the past four years. The net dollar saving generated from the in-house program are also much larger, reaching over one billion dollars in two of the years reviewed.

After comparing Tables 3 and 4 a few general, yet simple questions seem to arise:

1. Why is there such disparity between the two programs?
2. Why are contractors not generating more VECPs when they are the specialists who know and/or meet our needs and ingenious changes and improvements can only increase their profit percentages?
3. How can we urge more contractors to participate in VE?

The questions and the previously identified trends appear to validate and reinforce the four major concerns identified earlier in the VE problems section. Contractors quite possibly are distrustful of the VE program and question DOD management support of VE. Is the DOD truly active in promoting and reinforcing the benefits of VECPs or are they simply inattentive to providing incentives for more active VE participates? Recommendations for possible improvements in these areas of concern will be proposed in Chapter VI. The next section focuses on evaluating the Defense Logistics Agency (DLA) VE statistical data for the past four years, and the following section examines Navy Supply Systems Command (NAVSUP) VE information. The data presented in both the DLA and NAVSUP sections, directly reflect on VE performance as it relates to spare parts procurement.

2. DLA VE STATISTICS

Due to the current restructuring efforts (consolidation) that are ongoing today within the DOD, the DLA will be receiving approximately an additional one million consumable parts for management throughout the next year. As of March 1993, the DLA manages 62 percent of the 5 million items (3.1 million) and 70 percent of the 4.4 million consumable parts (3.08 million) in the Federal catalog, for a total of 6.18 million spare parts [Ref. 50]. For the DOD to recognize significant VE savings in the spare parts procurement process, DLA will have to embark on a serious VE endeavor.

The current DLA regulation (DLAR) guiding the VE program is dated 5 April 1985. It is however, currently under review and soon to be published with various changes for improvement. The proposed or draft DLAR is very exhaustive, requiring the five Defense Supply Centers (DSCs) to take a pro-active approach toward VE. The regulation addresses the total DLA VE program plan; highlights include: eight annual VE achievement awards, selection of an annual outstanding VE action for public recognition, procedures for selection of in-house VE study projects and proposals (a potential ROI of only 10:1 is required), training requirements, emphasis on expedient processing of VECPs, and recognition of other related cost saving/avoidance techniques such as reverse engineering and "should cost"/intrinsic value analysis

procedures [Ref. 26]. It appears to be a well-organized and all inclusive document which should enhance successful employment of the DLA VE program in the future. The DLA operations and research department is also analyzing potential development of a computer model to assist in identifying potential spare parts for VE review. Currently, DLA VE personnel primarily evaluate spares that are high dollar items or procured from a sole source. Other factors that might be screened in the future include large quarterly demand parts, consumable items transfered from the Services, unacceptable production lead times, and readiness issues [Ref. 50]. Table 5 is a summary of DLA VE information for the past four years.

The data from DLA again indicate the fact that contractor participation is quite low, almost nonexistent in 1992, with only 36 VECPs received and 16 approved for a meager net savings of 1.4 million dollars. The in-house VE efforts seems to be quite adequate and pretty consistent, maintaining about 115 VE personnel and achieving an average 64.4 million dollars in savings annually. The DLA program is well established but will need increased attention in the future years as a result of the changing spare parts management environment. Through more concentration on the VE program, DLA will eventually attain even greater savings.

TABLE 5

Defense Logistics Agency
VALUE ENGINEERING PROGRAM SUMMARY

	1989	1990	1991	1992
# of Full time VE Personnel	117	121	114	118
# VEPs: developed/ approved	2214/ 1972	1882/ 2196*	2887/ 3502*	3512/ 3401
**Net Savings	$67.2M	$47.4M	$64.8M	$78.1M
# VECPs: received/ approved	108/ 43	75/ 44	40/ 24	36/ 16
Net Savings	$1.72M	$4.79M	$1.95M	$1.44M
Total ROI (Includes VEPs & VECPs savings)	15:1	11:1	13:1	14:1

*Quantity approved exceeds number developed due to carry over from previous year.

**This figure does not include the savings reported for the Contractual Aspects of Value Engineering (CAVE) which are classified as indirect savings generated from other than the DLA VE office. If the CAVE savings are included, then the ROI ratios improve significantly; 28:1, 21:1, 25:1, and 21:1 for the years 1989 through 1992 respectively.

Source: Developed by the researcher.

3. NAVSUP VE STATISTICS

The NAVSUP VE data over the past four years are provided in Table 6. These figures are for the Navy supply system only, which reflect spare parts VE data. As noted earlier the total Navy VE statistics can be found in Appendix C. The history of VE in general at NAVSUP has seen its ups and downs. Changes in VE policy were often politically driven

and reflect the commanders decision as to which programs deserve attention. The NAVSUP VE program reached its most productive year in 1989, achieving a total savings of greater than 18 million dollars [Ref. 51]. During this period they were very active in educating contractors on the Navy VE program and its goals. Two briefings were given to small businesses in Cleveland, Ohio and Detroit, Michigan, during '88 and '89 [Ref. 51]. Toward the end of the 1989 fiscal year the VE program was cut back significantly and has since declined. NAVSUP's VE information presented in Table 6 includes Navy Facilities Command (NAVFAC), Ships Parts Control Center (SPCC) and Aviation Supply Office (ASO).

As mentioned before and seen in the data, the NAVSUP VE program is essentially nonexistent today as a result of the 1989 change of commanders focus. The personnel reductions have left only one dedicated VE representative, and the position is symbolic at best. These changes have lead to little VE activity on both the in-house and contractor programs. The SPCC VE manager, Dick Zider, explained that they were once active promoters of VE, conducting contractor fairs and placing VE advertisements in trade magazines. These promotions had created increased involvement in both VEPs and VECPs submissions, leading to significant savings [Ref. 55]. However, recent budget constraints and the consumable parts transfers that are ongoing, have severely impacted on SPCC's

TABLE 6

Naval Supply Systems Command
STATISTICAL SUMMARY OF VE ACTIONS

	1989	1990	1991	1992
# of Full time VE Personnel	5	3	1	1
# VEPs: developed/ approved	43/ 43	15/ 12	3/ 2	3/ 1
Net Savings	$8.95M	$1.8M	$201K	$12K
ROI	265:1	869:1	11:1	5:1
# VECPs: received/ approved	58/ 36	23/ 14	11/ 7	5/ 3
Net Savings	$9.57M	$7.02M	$614K	$5.15M
ROI	81:1	16:1	15:1	147:1
Average processing time for VECPs(days)	N/A	61	82	51
# VECPs requiring plus 45 days	N/A	14	4	3

Source: Developed by the researcher.

VE business, and other cost avoidance programs like reverse engineering and the "break-out" procedure [Ref. 51 & 57]. In the past two years not much VE activity has occurred at SPCC and their focus has shifted to Total Quality Leadership (TQL) [Ref. 57].

Another key item that NAVSUP reports is the average processing time for VECPs. As Table 6 indicates, for the three years reported on, the total processing time exceeds the required time of 45 days established by the Federal

Acquisition Regulation (FAR). This again reflects contractor concerns with the Government's commitment to VE.

To overcome the recent difficulties NAVSUP has fallen victim to, they intend to "re-energize" their VE program through support of VE from their new commander and will be acting on an aggressive plan to align VE with TQL. Initiation efforts are also underway to re-establish personal contact between cognizant VE personnel and the twenty-five largest suppliers for each inventory control point (ICP), to include presentation of a more detailed briefing to the contractor and challenging them to submit two or more VECPs each year. Additionally, a nation-wide round of contractor conferences is presently being discussed in cooperation with the DLA VE program office. The goal of this total VE initiative is to see positive results within the next two years [Ref. 51].

D. ANALYSIS/KEYS TO APPLYING VE TO SPARES PROCUREMENT

As explained in Chapter IV, the procurement of spare parts consists of two distinct phases, initial and replenishment spare parts procurement. Since the provisioning process is intertwined with the major systems acquisition program and process, it is necessary to evaluate the initial spares procurement process in conjunction with the VE program for the major systems acquisition process. The replenishment spares procuremer. VE process will be discussed separately.

Before addressing each of these areas though, it is critical to understand that changes produced from the VE process must be properly managed and evaluated prior to acceptance. Any changes in components or the product itself may have profound effects on not only its cost, but performance, appearance, compatibility, configuration (a most crucial area which must be thoroughly surveyed) and the manufacturing process. Communication between the Government and contractor as well as among several different internal Government offices or departments is required to totally review the complete effect that the change will create. It is often a difficult process, requiring a team effort based on strong working relationships and communication.

1. VE CONCERNS FOR INITIAL SPARES PROCUREMENT

The definition of VE, indicates the fact that the VE process is a systematic evaluation which should be an ongoing process throughout the entire development and production of a product or service. The Government currently implements VE within the major systems acquisition process at Phase II, the Engineering and Manufacturing Development (EMD) phase, even though earlier emphasis would be more advantageous. It is at this time where the provisioning process for spares parts is also initiated. The VE effort that the contractor undertakes for the entire weapon system program will directly impact on the initial spares to be procured.

For the VE program to wholly impact on the provisioning process, VE work should begin earlier at the Demonstration and Validation (DEMVAL) phase (see Figure 1 for the major system acquisition phases). There is no need for the VE process to begin with the Concept Exploration phase because at this point the various contractors with Research and Development (R&D) contracts are already motivated to do the best possible job and to provide the most innovative product to satisfy the Government needs. The contractors are seeking continued business via advancing into the next phase, provided they are successful at developing a satisfactory product. It is at the conclusion of DEMVAL where the Government begins to weed out some of the contractors and proposed solutions or alternatives. During the DEMVAL phase is where the Government should emphasize the participation or requirement for VE. To execute and complete this phase the contractor must produce the first prototype of the system or various components of the system (which will eventually require provisional spare parts to support it) for testing. It seems only logical that the VE effort begin to improve the process and product at the earliest time possible.

The change to use VE during DEMVAL emphasizes the philosophy of early versus later VE participation. VECPs have the greatest cost savings potential when incorporated at the earliest possible point. The Life Cycle Costs (LCC) of a program start at the Mission Area Analysis (MAA) or needs

determination step. The earlier VE is implemented, the greater the savings or "cost avoidance" will be. The increased savings is caused by more units in the production run being affected by the change and lower implementation costs which will carry throughout the remaining acquisition phases. For the contractor, his total share savings will be higher, leading to increased profits. This should be an incentive as profit is the primary stimulus to encourage contractor participation in VE, and large profits can be accumulated through VE — contractors earn about 43 cents for each dollar the DOD saves through approved VECPs [Ref 30: p.3-2]. The earlier in the procurement process VE is started the better off both the Government and contractor will be. Also through early VE application the initial spare parts are more likely to be properly designed and capable of supporting the system when it is deployed.

It must be recognized that the procurement of spare parts throughout either phases I or II (DEMVAL or EMD) is very difficult because of design instability. The contractor VE effort will be directed at the entire weapon system, not individual spare parts. The contractor most likely will not have the time or resources to put forth a strong VE review of applicable individual spare part for potential improvements and savings opportunities. The primary focus of the contractor at this time in the acquisition cycle will be staying on schedule and within the original cost estimates,

with the goal of providing an operational system that fulfills the contractual agreement and meets the needs of the customer. The contractor will not be expending much effort and resources on cost saving techniques such as Value Engineering.

The provisioning process appears to be oriented toward the Spares Acquisition Integrated with Production (SAIP) program. The SAIP concept attempts to take advantage of economies of scale by combining and procuring spare parts concurrently with parts being produced for the end item. Thus, SAIP too is a cost avoidance program. It tries to minimize the cost of spares by avoiding the numerous charges related with individual purchase orders and manufacturing processes. The SAIP program is not solely limited to the provisioning process and can also be incorporated into the acquisition of replenishment spare parts. As system production continues out over many years, the spares can be procured simultaneously during production of the system items.

Considering the factors discussed above, it is difficult to expect sincere VE efforts from the contractor directed toward the initial spares that will be procured. The most critical product the Government must receive in the provisioning process is an adequate technical data package (TDP) for all the parts procured. The TDP can pay dividends later, in the replenishment spare parts procurement process, through VE commitment and reverse engineering. With this in

mind it seems that greater potential for VE application is obtainable in the procurement of replenishment spare parts.

2. VE CONCERNS FOR REPLENISHMENT SPARES PROCUREMENT

That VE earlier in the acquisition process is better, doesn't imply that later in the process, VE efforts will not yield significant savings. Replenishment spares are procured at a point when the operational system has been stabilized and after the initial spares have been depleted. It is at this point in the acquisition cycle, Low Rate Initial Production (LRIP), that specific application of VE energy can and should be applied to individual items and components of the system, i.e., the spare parts for the system.

The improved performance and quality as well as cost savings aspect of the VE concept must continue to be emphasized throughout the life cycle of the system. It must be continually elaborated that there is always opportunity for additional savings or improved quality and performance throughout the life of the program. A simple VE example illustrates this issue: Over time a spare-part has been proven to be much more reliable than originally expected. As a result the contractor or a Government representative may recommend that testing requirements could be reduced or eliminated. The effect of this simple change can lead to significant reduced costs when procuring the item.

As also noted earlier, Value Engineering seems to be most effective and work best with products that are unique in nature or of relatively new design, i.e., a new weapon system and its supporting spare parts fit this requisite. These types of items allow for flexibility and innovation on the part of the contractor. Parallel to this reality, is the idea of trying to have the contractor challenge the Government on unrealistic requirements and specifications. This effort also reflects on the relatively recent major policy shift within the DOD to utilize commercial specifications versus Federal or military specifications, as well as functional or performance specifications over design specifications whenever feasible. The mandatory/required VE approach is recommended for use in contract situations where these type of specifications are utilized and the contractor is likely to recognize cost savings. Voluntary or incentive VE clauses should be used when the contractor is working to detailed drawings and design specifications.

The primary goal and objective of VE is associated with dollars, specifically cost savings and return on investment, which has lead the majority of VE applications on spare parts to center on high dollar items, large quantity requirements, and sole source items. These three areas are obvious starting points to begin when evaluating spare parts for VE candidates and savings. However, as high dollar items, large quantity requirements and sole source items become less

available, other potential factors or items must be considered for cost savings. These other factors or areas of concern for VE employment should not be underestimated or overlooked. They include reliability and maintainability, producibility, production lead times, performance, and quality. Improvement in these areas are often difficult to quantify and equate to dollar savings, and consequently make the decision to use resources and VE techniques hard to justify. This is the direction that VE must proceed in the replenishment spare parts procurement process if it is to expand and be used to its fullest potential rather than remain underutilized.

Other key cost savings techniques which are closely related and associated with the VE program include: value analysis techniques like the current "should cost" and "could cost" approaches discussed earlier; reverse engineering, which takes a component or spare part and breaks it down to each individual part to understand how the item functions and is manufactured; and the "break-out" program, which focuses on procuring items directly from the source, eliminating the middle man (prime contractor). The uniqueness VE has to distinguish it from these programs is that VE is both in-house and contractor oriented, while these other cost saving programs are conducted through in-house work only. These concepts along with VE all strive to generate significant cost savings in the procurement process. By mixing or integrating these different programs into the procurement of spare parts,

the DOD can draw upon each program's strengths to achieve maximum savings. Caution must be given however, to ensure that these various programs are implemented as intended and that the programs remain distinctive in nature and application. If not, the programs will become obscured and lose their effectiveness.

A new twist has recently been augmented to the VE program by the Navy Aviation Supply Office (ASO) which directly impacts on the way VE is applied to spare parts procurement within ASO. This new approach is known as the Logistics Engineering Change Proposal (LECP) and will be dicussed next.

E. LOGISTICS ENGINEERING CHANGE PROPOSALS (LECPs)

The Logistics Engineering Change Proposal (LECP) is very similar to a VECP and the VE process, however it is a much more efficient program. It is strictly an Navy Aviation Supply Office (ASO) program designed to cut through much of the bureaucratic red tape and review process associated with the formal VE process [Ref. 53]. As a result of the compressed procedures for approving the LECP and reduced processing time required, the Government and contractor will be able to realize more cost savings. This approach should be appealing to all parties involved.

The LECP process is part of the Best Overall Support Solution II (BOSS II) program. The purpose of the BOSS II

program is to develop a logistical partnership based on continuous program improvements, between Naval Air Systems Command (NAVAIR), ASO, the Fleet, the NADEPs, and industry to reduce costs to the customer (the Fleet) while maintaining Fleet readiness [Ref. 38:p. 1]. An LECP is defined as:

> A reliability or maintainability related Engineer Change Proposal (ECP) for an ASO managed item, sponsored and funded by ASO, designed to reduce or eliminate support costs while maintaining or improving safety and performance. [Ref. 38:p. 6-2].

A key feature to this program is the use of ASO funding to implement the LECP rather than requiring program office dollars to be used as in the case of VECPs. Typical candidates are items with high reprocurement costs and/or high repair costs that promise a quick return on investment (ROI within five years) [Ref 38: Encl. 2]. Once the candidate is identified it undergoes a cost-benefit analysis as well as the ROI calculation. Appendix D provides a flow chart to illustrate the functions required to process an LECP from candidate identification to the Configuration Control Board (CCB) approval. Since the BOSS II initiation, ASO, by replacing items with high reprocurement costs and/or high repair costs with more reliable items, is reducing the need for reprocurment and reaping significant near-term and long-term savings [Ref. 38:p. 6-3]. Since the BOSS II program has

only been in effect less than a year, it is hard to evaluate it's success but it appears to show great potential.

The use of Navy stock funds makes this program quite unique. An argument can be made for this funding situation for two basic reasons. First, there is a direct advantage to the stock fund for any savings generated by the VE mechanisms. This advantage results when reduction of unit prices is achieved, thereby allowing de-obligation of stock funds and allowing them for reuse. Second, this approach frees the program from the cyclic problems of funding constraints, i.e., there is no need to use program dollars and/or worry about staying within budget. The bottom line is that it makes sense because the stock fund receives the benefit from LECP/VECP on the spares through lower costs so the stock fund should pay for it. The BOSS II program and LECP concept have the ability to increase savings and eliminate a crucial factor which often hinders contractor participation in VE. As the program unfolds and matures, other DOD organizations should take a hard look at its procedures and take the necessary actions needed to implement its philosophy. The result will be superior VE utilization and increased savings.

F. THE FUTURE OF VALUE ENGINEERING

As communicated throughout this thesis, Value Engineering offers great opportunities for increased contractor profits and substantial saving for the Government in suitable

procurement actions. The soon to be issued, revised OMB Circular No. A-131 will reinforce the importance of VE as a well proven cost reduction/saving program. This will lead to increased Government emphasis and contractor involvement. Another important evolution is the continued debate in the House of Representatives on House Rule 133 (H.R. 133), short title: "Systematic Application of Value Engineering Act of 1993," dated January 5, 1993, which will too increase VE awareness. Industry is also taking an active role in recognizing the extensive uses for VE through the actions of the Society of American Value Engineers (SAVE).

Value Engineering should promise to be an exciting program in the near future. It has the capacity to assist in maintaining the industrial base during the prevailing defense conversion drive in today's rapidly changing defense procurement environment. In this respect, VE may be used as a tool to assist in keeping engineers active and on the cutting edge despite reduced procurement of new weapon systems.

Lastly, VE can also be used, by both the contractor and Government to influence many decisions faced in the acquisition arena, for example; make vs buy decisions, design to cost analysis, and analyzing the LCC of programs. It is evident that VE has many advantages and needs to be viewed as an outstanding cost saving technique which has many benefits for all who properly apply it.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. OVERVIEW

This chapter presents the conclusions and recommendations of this research effort. Value Engineering is a complex process and requires a great deal of effort and emphasis to be fully utilized. The primary research question of this thesis was to determine what extent the DOD VE program is applicable to the procurement of spare parts, and how should VE be utilized for maximum benefit? From the results of the research, three conclusions are made: First, VE is a proven cost saving tool but underutilized in spare parts procurement. To maximize savings, the VE effort should be emphasized in the replenishment spare parts procurement process. A serious undertaking needs to be initiated to stimulate more contractor VE participation in the spare parts procurement process. Second, there continues to be a lack of top management support within the DOD for the VE program in general, which directly impacts on the VE investment in spare parts procurement. And third, the current DOD procurement environment of reduced budgets and fewer major weapon systems acquisitions leads to a need for more emphasis of VE on the spare parts procurement process. Based on these conclusions, recommendations are made which offer a means to encourage more application of Value

Engineering in the procurement of spare parts and provide greater incentive to partake in VE in general. This chapter closes with some suggestions for further research.

B. CONCLUSIONS

The first conclusion is concerned with the fact that Value Engineering is a proven cost saving tool for the Government and contractor alike, in both major systems acquisitions and spare parts procurement, which is however underutilized in the spare parts procurement process. The basic VE philosophy is simple, but the program is often difficult to execute in the two procedures of spare parts procurement.

The primary effort of VE in spare parts procurement is through the in-house (VEP) program. Contractor participation is lacking. The VE effort in the spare parts procurement process should be emphasized during the replenishment spare parts procurement process. Opportunities for significant savings are greatest here as opposed to the provisional procurement process as reflected in Chapter V.

The Defense Logistics Agency (DLA) will need to become more aggressive in using VE towards spare parts procurement as they continue to receive more spare parts. The new Logistics Engineering Change Proposal (LECP) process established at the Navy Aviation Supply Office (ASO) in their BOSS II program should be evaluated to determine if similar processes could be applied throughout the entire DOD. The benefits of reduced

processing and approval times of accepted LECPs, combined with the change in funding procedures, could play an important factor in enticing more contractor participation in VE directed toward the spare parts procurement cycle.

The second conclusion relates to VE in broad terms. It is the fact that top management support within the DOD has been lacking throughout the history of VE. This problem must be overcome. In order for any program to be successful it must be perceived in a positive manner and promoted by the leaders of the organization. It is adamant that the VE process and concept receive top management support. Sufficient training and allocation of funds for the VE program must be a prime emphasis by top management. Each functional, project/program or acquisition manager must cooperate and participate to ensure an effective program. Until this occurs VE will continue to produce savings well below its full capacity.

It appears that the needed policies and direction through the various DOD directives, instructions, manuals and letters, are in place, yet there seems to be some hesitancy to fully apply the essential support needed to get the ball rolling in the VE domain. To accomplish this there needs to be an attitude shift, a recognition and acceptance that VE is a desirable program, not just a renewed vision of an old program. Leaders within the acquisition and contracting profession need to promote the VE program, begin training and educating a significant number of VE management sections, and

establish realistic goals and objectives for VE savings. With a truly dedicated DOD wide effort toward VE, contractors will begin to take heed and follow our lead, thus leading to more participation and submission of VECPs, equalling more savings.

The third conclusion addresses the current DOD procurement environment and the need to stimulate more VE participation. The continued budget constraints and reduced acquisitions of major systems indicates that DOD dollars are getting tight. The DOD needs to promote all cost saving or cost avoidance programs which are available.

The dwindling resources impact on the contractor in a different fashion. They must become more competitive to receive future contract awards. To remain competitive and acquire more contracts, contractors need to maintain strong and active engineering programs. VE offers many opportunities for employment of engineering personnel and is oriented toward seeking innovative, state of the art improvements. Through VE evaluation and improvement of spare parts, contractors will be able to acquire more profits and also maintain their strong engineering assets.

It also appears that a renewed effort for implementing the Value Engineering philosophy will soon be forthcoming, as history is sure to repeat itself. The issuance of a new OMB Circular along with the current discussions ongoing in the House of Representatives, regarding H.R. 133, will surely refocus top level attention on the VE process. These, along

with the continued budget constraints, will surely have an impact on the future direction and use of the Value Engineering program within the Department of Defense and Government agencies in general.

C. RECOMMENDATIONS

The following recommendations are made based on the three conclusions previously identified. These recommendations should result in a more energetic VE program in spare parts procurement and major systems acquisitions within the DOD procurement environment.

1. In an attempt to improve contractor participation and also assist top management in committing to the VE program, the VE community and advocates should embark on an all out education and training program. Training and education should begin at the top and proceed to the lowest working levels and must include both Government and contractor personnel. The process will take a significant amount of energy and time but when completed it should benefit all involved. The goal of this plan should be to institute a cultural change and acceptance of the VE program throughout the acquisition profession.

2. The dollar threshold for mandatory inclusion of VE clauses should be increased through legislation from the current FAR requirement of contracts greater than $100,000 to $1,000,000. The change would eliminate one of the primary

impediments cited by Government executives and VE personnel by eliminating any potential "defective pricing" concerns as mentioned in Chapter V. The VE clause would no longer be viewed as just another mandated requirement, as often is the case in small contacts. The million dollar figure would place VE emphasis on 77 percent of the total acquisition dollars obligated as was seen in Table 2. This change would also allow Government program/acquisition managers to focus VE use on a smaller total number of contracts as was also identified in Chapter V.

The change would however have a catch to it, in the sense that a new policy or procedure would need to be incorporated into the FAR to accept unsolicited VECPs from contracts below the $1,000,000 dollar figure. By creating this new policy, the Government would still allow the lesser dollar contract awardees to take part in the VE program.

3. To truly stimulate participation in Value Engineering in general, it is proposed that a system be designed where by the savings generated through the VE program are not all categorized as savings and totally recovered by the Government. It is necessary to consider a new method of VE program funding which allows a percentage of the savings generated to be retained by the Government VE activity creating the savings. This type of funding philosophy follows the same principles established by ASO in their BOSS II program, which appears to be quite successful.

Assume it could be agreed that 10 percent of the savings generated could be retained by the VE organization. The result of this approach in 1992 would have allowed DLA and NAVSUP to recover $7.9 million and $500,000 dollars respectively. A policy of this nature should allow the activity, program, or agency to reallocate the additional dollars reclaimed through the VE savings as they see fit. Most likely a majority of this money would be kept by the VE agency and invested in maintaining or improving the VE program. These dollars could be used for additional personnel or procurement of new state of the art hardware such as computer programs and systems, i.e., Computer Aided Manufacturing (CAM), Computer Aided Design (CAD), and Computer Aided Logistics (CAL) systems. As a result of these purchases and enhancements the entire VE program will improve. The VE funding policy should no longer rely on a simple capped budget ceilings for VE programs, as in the past. The proposed funding approach would provide a strong incentive for VE participation; people will and do respond to incentives of this nature, i.e., dollars.

4. To augment this effort, public recognition of VE achievements needs to be emphasized for both DOD and contractor performance. Acknowledgment similar to that of the Ford Quality program of recent years is a prime example of how public recognition and praise can improve quality and support. Also, the DLA VE program is quite active in this area and

could be used as a model for other programs. Public acknowledgment is a very effective motivator and could pay great dividends for improving the whole VE program.

5. As noted in Chapter V, there must be a stronger effort of VE in the earlier phases of the acquisition process for major systems. VE should begin in phase I, Demonstration and Validation (DEMVAL) instead of the current guidance of initiating it during Engineering & Manufacturing Development (EMD). The purpose of this change is to incorporate VE with the production engineering and productibility efforts which starts at DEMVAL, and continue it through the production and development phase. The earlier use of the VE function would benefit the entire acquisition process, including spare parts procurement.

Implementation of these recommendations will reflect the seriousness that the Government feels about the Value Engineering program and its potential. Defense contractors will then become more active in the DOD VE program.

D. AREAS FOR FURTHER RESEARCH

Based on the research effort conducted for this thesis, the following areas relating to Value Engineering and spare parts procurement are suggested for further research:

1. Conduct a survey with twenty-five of the DLA top ten percent dollar contractors who have been involved with the Value Engineering program in recent years. The focus of the

survey should be directed at determining what their current attitude is concerning the DOD VE program?, What are the prevailing problems associated with the program that deters participation?, and How can we change the system to prompt more contractor participation?

2. Since VE is only one of many techniques for cost reduction/savings, a study should be conducted to determine if the various programs (Reverse Engineering, "Break-out", Should/Could Cost Analysis, Spares Acquisition Integrated with Production (SAIP)) are collectively forming an effective and comprehensive effort at reducing costs. These programs may be found to be duplicative in nature, competing against one another for scarce resources, resulting in an overall inefficient cost saving effort.

3. Compare and contrast the DOD in-house VE program with the DOD VE program for contractors to determine why the in-house effort is so much more productive in regards to VE application for spare parts procurement. There is little information available of how the two interface and this research may provide some useful insight into how the DOD VE program might be best structured.

The bottom line objective of the DOD VE program is to motivate contractors to practice Value Engineering and to entice them to submit VECPs resulting in cost savings which they partake in through the established share ratios. This is a large and complex topic and it is difficult to touch on

every relevant issue that is associated with VE. The research effort put forth in this study should shed some light on the fact that Value Engineering is a powerful tool within the acquisition profession, for all forms of procurement, which still has yet to reach full implementation and potential.

In summary, with the current economic situation in industry (downsizing) and DOD budget cuts, it seems important that every possible cost reduction program be looked at for better and stronger implementation. Enlightened awareness of Value Engineering should be a key element in the DOD overall approach to improving productivity and reducing acquisition costs in the future for both spare parts and major weapon systems.

APPENDIX A

INTERVIEW QUESTIONS

1. What are the published standard operating procedures for applying Value Engineering to spare parts procurement?

2. What are the key elements that are looked for in deciding whether the spare part has potential for VE application?

3. Are both realistic goals and reasonable incentives set?

4. Is proper recognition or awards given for achieving significant savings?

5. Has the VE program been allotted sufficient funds, office space, people, and equipment?

6. Is there an interrelationship between VE and reliability, quality control, purchasing, etc.?

7. Who are the key players in the VE program and is it organized efficiently?

8. Are there periodic audits of the VE function/process?

9. How can we better improve or involve contractor participation in VE in spare parts acquisition?

10. Is there a VE training program in place? (Duration, who and number of personnel annually trained)

11. Are accurate costs of parts, processes, material, labor, and all other factors available?

12. When in the part life-cycle or supported system life-cycle is VE accomplished?

13. What are the problems involved in the VE effort in spare parts acquisition?

14. Is the use of a decision-making model or checklist used and if so what are it's key factors?

15. Please provide any additional comments or suggestions for improving VE use in the acquisition of spare parts.

APPENDIX B

Sample Value Engineering Saving Process

ORIGINAL CONTRACT AGREEMENT:
Navy to purchase 50,000 units at $200.00 each

Total Contract Price		$10,000,000
Production Cost	-	$ 9,000,000
CONTRACTOR PROFIT		**$ 1,000,000**

CONTRACTOR SUBMITS A VECP:

VECP results in a new unit cost of $150.00 each, thus resulting in a $50.00 savings per unit.
This VECP will affect the second half of the production run for this contract; a total of 25,000 units.

Contract Savings		$ 1,250,000 ($50 x 25,000)
Developmental Costs	-	$ 50,000 (Contractor)
INSTANT CONTRACT SAVINGS		**$ 1,200,000**
Implementation Costs	-	$ 50,000 (Government)
NET ACQUISITION SAVINGS		**$ 1,150,000**

Assume the Share Ratio for this contract is 50/50.

Contractor Share		$ 575,000 ($1.15M x .50)
New Contract Price	+	$ 8,800,000 ($10M - $1.2M)
AMENDED CONTRACT PRICE		**$ 9,375,000**

The Government recognizes a net savings of $625,000 from the VECP ($10,000,000 - $ 9,375,000).
How does the VECP impact upon the contractor, both in savings and profit margin?

New Contract Price		$ 9,375,000
New Production Costs	-	$ 7,750,000 ($9M - $1.25M)
NEW CONTRACTOR PROFIT		**$ 1,625,000**

THE CONTRACTOR PROFIT MARGIN INCREASES FROM 10% TO 16.25% BASED ON THE ORIGINAL CONTRACT AGREEMENT.

Additional profits can be generated from concurrent and future contract savings as well. This page will address these areas.

To continue with this example, assume the following savings are also generated as a result of the contractors submission of the VECP.

Concurrent Savings		$ 2,000,000
Future Savings (3YRS)	+	$ 7,000,000
TOTAL ADDITIONAL SAVINGS		**$ 9,000,000**

These additional savings can be generated as a result of the "Break-Out" process, Reverse Engineering, or just plain old competition, whereby other contractors are producing items that are effected by the submission/acceptance of the VECP.

Contractor Share		$ 4,500,000 ($9M x .50)
New Contract Price	+	$ 9,375,000 (Original Contract)
TOTAL GOVERNMENT COSTS		**$13,875,000**
New Production Costs	-	$ 7,750,000 (Original Contract)
FINAL CONTRACTOR PROFIT		**$ 6,125,000**

There needs to be some cautionary remarks made concerning this extremely rosy picture portrayed here, e.g. the more than 600 percent increase in profit to be recognized by the contractor for his VECP. First, concurrent contracts are not awarded as frequently as their treatment in the FAR might suggest. Second, the contractor may opt for settling future savings via the negotiation of a "lump sum" payment, which might be considerably lower than waiting for the three years to collect on contracts which are impacted by the VECP. Also, the VE process is not a risk free adventure, if a VECP is rejected by the Government then the contractor is unable to recoup any of their developmental costs and thus these expenses must be absorbed through the loss of profit dollar. Again remember, rejection of a VECP is not disputable.

Source: NAVSUP VE Contractor Brief, November 1989 [Ref. 51].

APPENDIX C

DOD VE STATISTICAL DATA
FISCAL YEARS 1989-1992

VE Worksheet FY 1989

			In-House	Contractor	
1. Investment	USA		$12,150,744	$10,642,000	
	USN		$18,500,000	$3,290,000	
	USAF		$11,990,442	$13,305,802	
	DLA		$4,500,000	---	
	Total		$47,141,186	$27,237,802	
				Savings	ROI
2. Savings/ROI	USA	In-House		$290,015,354	
		Contractor		$122,792,273	
	USN	In-House		$383,300,000	
		Contractor		$39,800,000	
	USAF	In-House		$436,136,051	
		Contractor		$52,457,610	
	DLA	In-House		$121,600,000	
		Contractor		$1,720,000	
	Total	In-House		$1,231,051,405	26:1
	Total	Contractor		$216,769,883	7:1
			Full-time	FTE	
3. VE People	USA		94	---	
	USN		26	13.2	
	USAF		6	3.8	
	DLA		117	9.7	
	Total		243	ERROR	
			>8 hrs	<8 hrs	
4. # Trained	USA		1,388	1,356	
	USN		1,700	732	
	USAF		442	909	
	DLA		217	515	
	Total		3,747	3,512	

			FY89 cont'd	
			Received	Approved
5. Props rec'd	USA	In-House	556	588
		Contractor	592	496
	USN	In-House	4,569	1,895
		Contractor	277	161
	USAF	In-House	430	200
		Contractor	196	116
	DLA	In-House	2,214	1,972
		Contractor	108	43
	Total	In-House	7,769	4,655
	Total	Contractor	1,173	816

VE Worksheet FY 1990

		In-House	Contractor
1. Investment	USA	$11,725,600	$8,514,700
	USN	$9,901,951	$750,713
	USAF	$19,843,824	$15,816,694
	DLA	---	---
	Total	$41,471,375	$25,082,107

			Savings	ROI
2. Savings/ROI	USA	In-House	$324,846,200	
		Contractor	$81,403,000	
	USN	In-House	$194,970,030	
		Contractor	$22,474,668	
	USAF	In-House	$517,982,770	
		Contractor	$129,095,350	
	DLA	In-House	$164,100,000	
		Contractor	$9,600,000	
	Total	In-House	$1,201,899,000	29 :1
	Total	Contractor	$242,573,018	10 :1

		Full-time	FTE
3. VE People	USA	97	0
	USN	22	2
	USAF	7	10
	DLA	121	8
	Total	247	19.9

		>8 hrs	<8 hrs
4. # Trained	USA	1,020	396
	USN	573	3,248
	USAF	163	495
	DLA	149	333
	Total	1,905	4,472

			FY90 cont'd	
			Received	Approved
5. Props rec'd	USAF	In-House	444	276
		Contractor	236	157
	USA	In-House	377	534
		Contractor	478	346
	USN	In-House	4,646	1,928
		Contractor	140	88
	DLA	In-House	1,882	2,196
		Contractor	75	44
	Total	In-House	7,349	4,934
	Total	Contractor	929	635

VE Worksheet FY 1991

		In-House	Contractor
1. Investment	USA	$18,825,000	$4,771,000
	USN	$5,070,000	$68,900,000
	USAF	$1,101,590	$68,603,855
	DLA	$5,100,000	---
	Total	$30,096,590	$142,274,855

			Savings	ROI
2. Savings/ROI	USA	In-House	$277,904,000	
		Contractor	$64,731,177	
	USN	In-House	$179,800,000	
		Contractor	$102,600,000	
	USAF	In-House	$117,762,988	
		Contractor	$229,404,343	
	DLA	In-House	$124,000,000	
		Contractor	$1,950,000	
	Total	In-House	$699,466,988	23.2 :1
	Total	Contractor	$398,685,520	2.80 :1

		Full-time	FTE
3. VE People	USA	71	30
	USN	12	17.6
	USAF	6	8
	DLA	114	6.3
	Total	203	61.9

		>8 hrs	<8 hrs
4. # Trained	USA	1,557	339
	USN	1,048	355
	USAF	180	443
	DLA	146	541
	Total	2,931	1,678

			FY91 cont'd	
			Received	Approved
5. Props rec'd	USA	In-House	355	494
		Contractor	338	196
	USN	In-House	2,466	1,098
		Contractor	122	76
	USAF	In-House	134	52
		Contractor	172	124
	DLA	In-House	8,186	3,502
		Contractor	40	24
	Total	In-House	11,141	5,146
	Total	Contractor	672	420

VE Worksheet FY 1992

		In-House	Contractor
1. Investment	USA	$17,999,000	$17,749,000
	USN	$25,810,000	$3,860,000
	USAF	$1,784,280	$80,704,433
	DLA	$5,670,000	---
	Total	$51,263,280	$102,313,433

			Savings	ROI
2. Savings/ROI	USA	In-House	$415,364,000	
		Contractor	$103,085,000	
	USN	In-House	$123,610,000	
		Contractor	$46,640,000	
	USAF	In-House	$84,164,603	
		Contractor	$168,063,118	
	DLA	In-House	$127,300,000	
		Contractor	$2,100,000	
	Total	In-House	$750,438,603	14.6 :1
	Total	Contractor	$319,888,118	3.13 :1

		Full-time	FTE
3. VE People	USA	75	150
	USN	5	12.53
	USAF	9	14
	DLA	118	6
	Total	207	182.53

		>8 hrs	<8 hrs
4. # Trained	USA	1,631	272
	USN	159	162
	USAF	159	247
	DLA	116	380
	Total	2,065	1,061

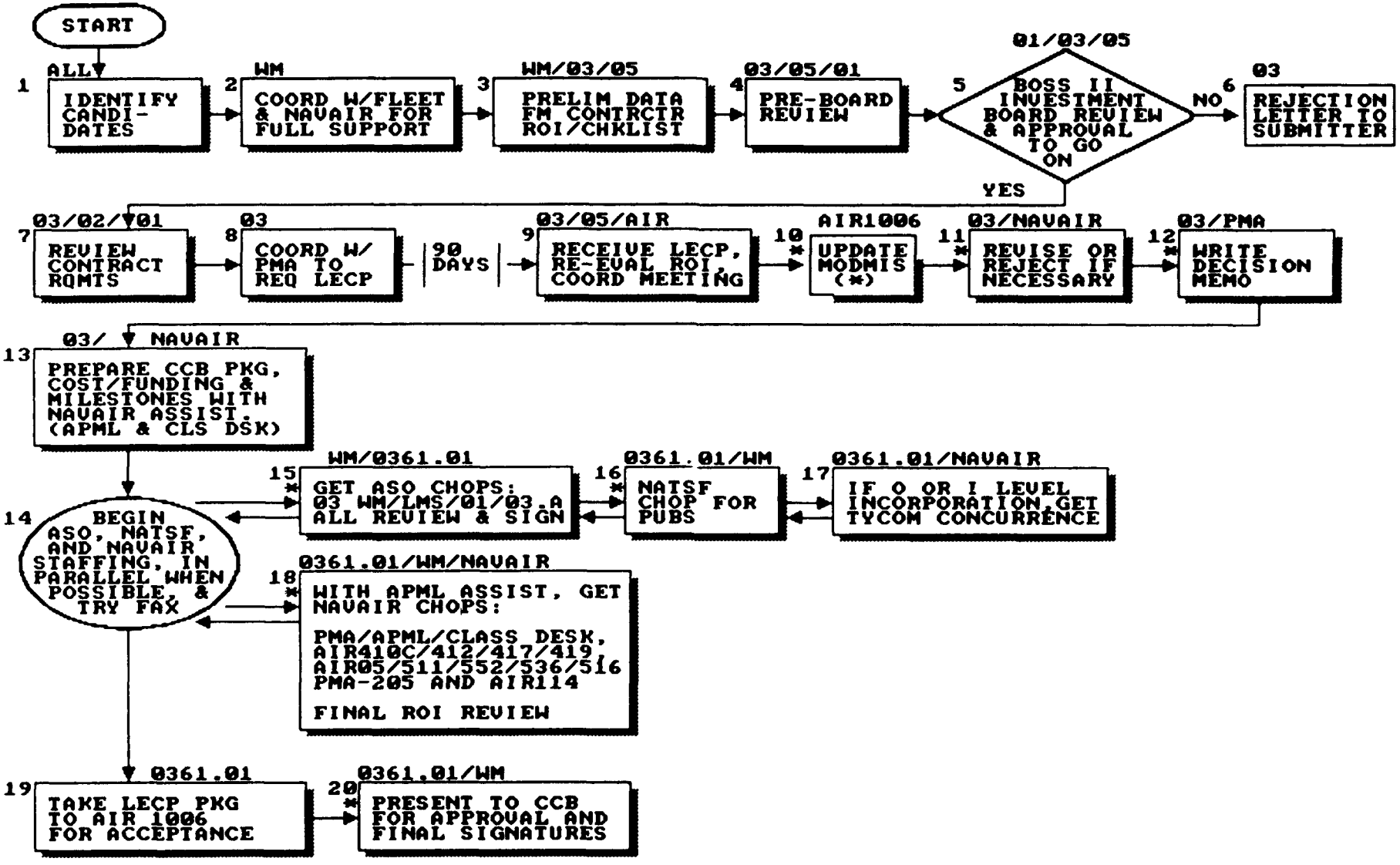
			FY92 cont'd	
			Received	Approved
5. Props rec'd	USA	In-House	269	464
		Contractor	369	224
	USN	In-House	1,279	459
		Contractor	495	101
	USAF	In-House	117	77
		Contractor	65	52
	DLA	In-House	6,774	3,401
		Contractor	35	15
	Total	In-House	8,439	4,401
	Total	Contractor	964	392

APPENDIX D

NAVAL AVIATION SUPPLY OFFICE (ASO)
LOGISTICS ENGINEER CHANGE PROPOSAL (LECP) PROCEDURES

LECP PROCEDURES

STEP 1: IDENTIFICATION TO CCB APPROVAL



Enclosure (1)

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